SNL Decon Formulation for Mitigation and Decontamination of Chemical and Biological Warfare Agents

Test Results

March 2000

Sandia National Laboratories

"...exceptional service in the national interest."

Technology Description

In response to a national initiative to combat the domestic chemical and biological warfare (CBW) threat, Sandia National Laboratories (SNL) has developed SNL Decon Formulation for mitigation and decontamination of chemical and biological (CB) agents. SNL Decon Formulation can be deployed as a foam, liquid spray, or fog. Experimental results indicate that the formulation works quickly, is effective against both chemical and biological agents, and does not generate toxic by-products.

Performance against Chemical Warfare Agents

In SNL tests of SNL Decon Formulation performance against chemical warfare (CW) agent simulants, half-lives for the decontamination of the simulants were on the order of minutes. Also, nuclear magnetic resonance (NMR) studies demonstrated that destruction of the CW simulants occurred without formation of potentially toxic by-products. The simulant test results were confirmed by a facility licensed to perform live CW agent testing. The formulation was deployed as foam, and the half-lives for the decontamination of the live CW agents were on the order of 2 to15 minutes (Figure 1).

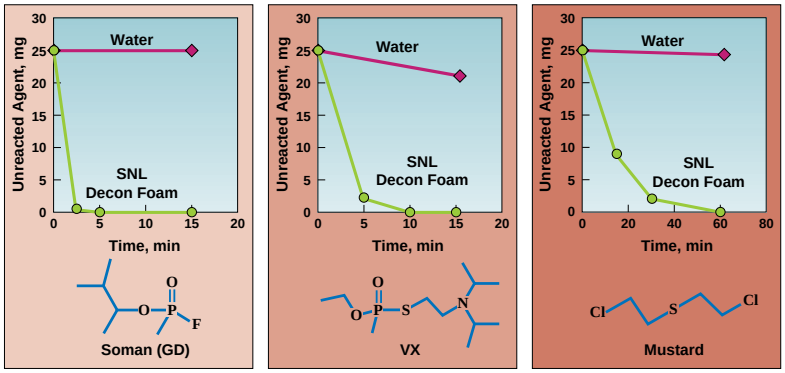

Figure 1. Decon of GD, VX, and HD (25 mg of agent on 25 cm² of paper)

Performance against Biological Warfare Agents

Three biological agent simulants were used in SNL tests of the formulation's decontamination performance: *Bacillus globigii* (a simulant for anthrax spores), *Erwinia herbicola* (a simulant for vegetative bacterial cells), and MS-2 *bacteriophage* (a simulant for viruses). For the *B. globigii* spores, a 7-log kill was obtained in an hour. Similar results were achieved for the vegetative bacterial cells and the viruses in 15 and

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30 minutes, respectively. The simulant test results were confirmed by a facility licensed to perform live agent testing of anthrax. In a solution test (i.e., the spores were added to the formulation), a 7-log kill was achieved during a one-hour exposure period (Figure 2).

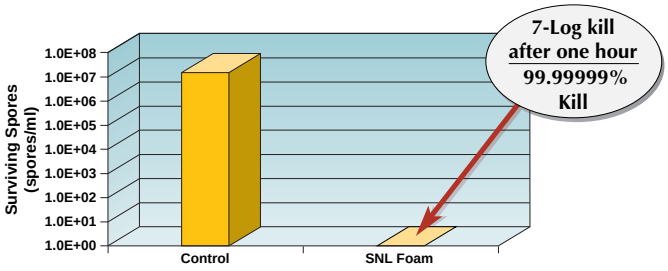

Figure 2. Anthrax spore kill

Performance on Substrates

In a test of the effectiveness of the SNL Decon Formulation on decontaminating a variety of substrate surfaces and orientations, the foam was deployed on seven different substrates. In these tests, the G-agent simulant (diphenyl chlorophosphate) was used. After exposure to the foam for 15 minutes, less than 5 mg of unreacted simulant on each substrate remained (Figure 3).

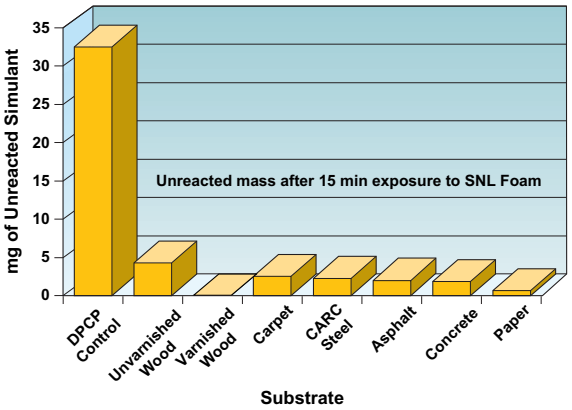

Figure 3. Decon of G-agent simulant (surface testing)

Military Tests

The SNL Decon Formulation was submitted to the Edgewood Chemical Biological Center (ECBC) at the U.S. Army Aberdeen Proving Grounds in Maryland for a study sponsored by the Department of Defense. Included in the study was a small-scale reaction rate test in which the liquid SNL Decon Formulation completely destroyed chemical agents GD (soman) and VX within 10 minutes, and HD (mustard) within one hour. In addition, SNL participated in a biological decontamination field test at the U.S. Army Proving Grounds at Dugway, UT. This field test was designed to test the effectiveness of decon formulations in killing spores of an anthrax simulant. *Bacillus globigii* spores were sprayed onto square-foot panels of materials commonly found in office buildings. Because the area to be decontaminated was relatively small and to show the versatility of SNL Decon Formulation, it was deployed as a spray (using a standard paint sprayer) rather than as a foam. After 20 hours of exposure to our formulation, the panels were tested by Dugway personnel for surviving spores. Results from these tests, which were repeated on four consecutive days and averaged, are shown in Figure 4.

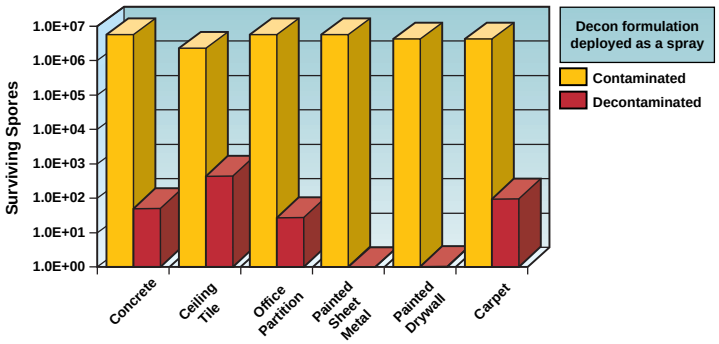

Figure 4. B. globigii (anthrax simulant) spore kill on office material panels

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy under contract DE-AC04-94AL85000.

Patent Pending

Sandia National Laboratories has applied for a patent for the technology. The U.S. Government retains rights to the technology for U.S. Government use. The U.S. Government has granted SNL the right to license and commercialize the technology.

Points of Contact

Mark Tucker
Principal Investigator
Sandia National Laboratories
phone: (505) 844-7264
fax: (505) 844-1480
e-mail: mdtucke@sandia.gov

Cecelia Williams
Principal Investigator
Sandia National Laboratories
phone: (505) 844-5722
fax: (505) 844-1480
e-mail: cvwilli@sandia.gov

Web site:
http://www.nwmp.sandia.gov/SNLdecon

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